COMPUTER SYSTEM LINKED BY USING INFORMATION IN DATA OBJECTS

The present application is a Continuation in Part of:

1) U.S. application Ser. No. 08/649,419 filed May 16, 1996 (now U.S. Pat. No. 5,862,260)

2) U.S. application Ser. No. 08/508,083 filed Jul. 27, 1995 (now U.S. Pat. No. 5,841,978)

3) PCT application Serial No. PCT/US96/06618 filed May 7, 1996,

The present application is related to:

1) application Ser. No. 08/637,531 filed Apr. 25, 1996 (now U.S. Pat. No. 5,822,436)

2) application Ser. No. 08/614,521 filed Mar. 15, 1996 (now U.S. Pat. No. 5,745,604)

3) application Ser. No. 08/534,005 filed Sep. 25, 1995 (now U.S. Pat. No. 5,832,119)

4) application Ser. No. 08/512,993 filed Aug. 9, 1995 (now abandoned)

5) application Ser. No. 08/508,083 filed Jul. 27, 1995 (now U.S. Pat. No. 5,841,978)

6) application Ser. No. 08/436,098 filed May 8, 1995 (now U.S. Pat. No. 5,636,292)

7) application Ser. No. 08/436,099 filed May 8, 1995 (now U.S. Pat. No. 6,710,834)

8) application Ser. No. 08/436,102 filed May 8, 1995 (now U.S. Pat. No. 5,748,783)

9) application Ser. No. 08/436,134 filed May 8, 1995 (now U.S. Pat. No. 5,748,763)

10) application Ser. No. 08/438,159 filed May 8, 1995 (now U.S. Pat. No. 5,850,481)

11) application PCT/US94/13366 filed Nov. 16, 1994,

12) application Ser. No. 08/327,426 filed Oct. 21, 1994 (now U.S. Pat. No. 5,768,426)

13) application Ser. No. 08/215,289 filed Mar. 17, 1994 (which is now abandoned)

14) application Ser. No. 08/154,866 filed Nov. 18, 1993 (which is now abandoned)

MICROFICHE APPENDIX

A microfiche appendix has been submitted with this application. The microfiche appendix contains 1077 pages on thirteen microfiche.

BACKGROUND

Hiding data in imagery or audio is a technique well known to artisans in the field, and is termed "steganography." There are a number of diverse approaches to, and applications of, steganography. A brief survey follows:

British patent publication 2,196,167 to Thorn EMI discloses a system in which an audio recording is electronically mixed with a marking signal indicative of the owner of the recording, where the combination is perceptually identical to the original. U.S. Pat. Nos. 4,963,998 and 5,079,648 disclose variants of this system.

U.S. Pat. No. 5,319,735 to Bolt, Berenak & Newman rests on the same principles as the earlier Thorn EMI publication, but additionally addresses psycho-acoustic masking issues.

U.S. Pat. Nos. 4,425,642, 4,425,661, 5,404,377 and 5,473,631 to Moses disclose various systems for imperceptibly embedding data into audio signals—the latter two patents particularly focusing on neural network implementations and perceptual coding details.

U.S. Pat. No. 4,943,973 to AT&T discloses a system employing spread spectrum techniques for adding a low level noise signal to other data to convey auxiliary data therewith. The patent is particularly illustrated in the context of transmitting network control signals along with digitized voice signals.

U.S. Pat. No. 5,161,210 to U.S. Philips discloses a system in which additional low-level quantization levels are defined on an audio signal to convey, e.g., a copy inhibit code, therewith.

U.S. Pat. No. 4,972,471 to Gross discloses a system intended to assist in the automated monitoring of audio (e.g. radio) signals for copyrighted materials by reference to identification signals subliminally embedded therein.

U.S. Pat. No. 5,243,423 to DeJean discloses a video steganography system which encodes digital data (e.g. program syndication verification, copyright marking, media research, closed captioning, or like data) onto randomly selected video lines. DeJean relies on television sync pulses to trigger a stored pseudo random sequence which is XORed with the digital data and combined with the video.

European application EP 581,317 discloses a system for redundantly marking images with multi-bit identification codes. Each "1" ("0") bit of the code is manifested as a slight increase (decrease) in pixel values around a plurality of spaced apart "signature points." Decoding proceeds by computing a difference between a suspect image and the original, unencoded image, and checking for pixel perturbations around the signature points.

PCT application WO 95/14289 describes the present applicant's prior work in this field.

Komatsu et al., describe an image marking technique in their paper "A Proposal on Digital Watermark in Document Image Communication and Its Application to Realizing a Signature," *Electronics and Communications in Japan,* Part 1, Vol. 73, No. 5, 1990, pp. 22–33. The work is somewhat difficult to follow but apparently results in a simple yes/no determination of whether the watermark is present in a suspect image (e.g. a 1 bit encoded message).

There is a large body of work regarding the embedding of digital information into video signals. Many perform the embedding in the non-visual portion of the signal such as in the vertical and horizontal blanking intervals, but others embed the information "in-band" (i.e. in the visible video signal itself). Examples include U.S. Pat. Nos. 4,528,588, 4,595,950, and 5,319,453; European application 441,702; and Matsui et. al, "Video-Steganography: How to Secretly Embed a Signature in a Picture," *IMA Intellectual Property Project Proceedings,* January 1994, Vol. 1, Issue 1, pp. 187–205.

There are various consortium research efforts underway in Europe on copyright marking of video and multimedia. A survey of techniques is found in "Access Control and Copyright Protection for Images (ACCOPI), WorkPackage 8: Watermarking," Jun. 30, 1995, 46 pages. A new project, termed TALISMAN, appears to extend certain of the ACCOPI work. Zhao and Koch, researchers active in these projects, provide a Web-based electronic media marking service known as Syscop.

Aura reviews many issues of steganography in his paper "Invisible Communication," Helskinki University of Technology, Digital Systems Laboratory, Nov. 5, 1995.

Sandford II, et al. review the operation of their May, 1994, image steganography program (BMPEMBED) in "The Data Embedding Method," SPIE Vol. 2615, Oct. 23, 1995, pp. 226–259.